

MATH555
Differential Equations
Practice Exam II

1. Solve the given initial value problem

$$y'' + 4y = 3 \sin 2t, \quad y(0) = 2, \quad y'(0) = -1.$$

2. Find the Wronskian determinant (up to a constant factor) of two independent solutions to the following equation.

$$x^2 y'' + xy' + (x^2 - \nu^2)y = 0.$$

3. Find the general solution to the given equation

$$y'' + 2y' + y = 6te^{-t}.$$

4. Find the general solution to the given equation

$$t^2 y'' - 3ty' + 4y = 2t^2.$$

- 5.

$$ty'' - (1+t)y' + y = t^2 e^{2t}.$$

- (a) (10 points) Verify that $y_1(t) = 1 + t$ is a solution to the homogeneous equation. Find another linearly independent solution.
(b) (10 points) Find the general solution to the nonhomogeneous equation.

- 6.

$$x'' + \gamma x' + 4x = \cos 2t + \sin 2t, \quad x(0) = 0, \quad x'(0) = 0.$$

- (a) Assume $\gamma > 0$, find the steady state $x(t)$ and its amplitude.
(b) Assume $\gamma = 0$, find $x(t)$.